In Response to the Challenges of Sustainability
Experiential Learning: A Paradigm for Sustainability-Oriented Architectural Education

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ABSTRACT:

This research aims at proposing a conceptual framework intended to facilitate the development of an interdisciplinary curriculum model, in which experiental learning becomes a paradigm for integrating sustainability principles within architectural undergraduate education.

The methodology is based on determining basic sustainability principles to be embedded within the curriculum, analyzing several sustainability-oriented curriculum models and abstracting the major objectives and practices in each. Parallel, is an exploration of some psychological, philosophical and educational acpects pertaining to experiental learning to be incorporated as a learning paradigm. A link is then drawn between the key issues of sustainable thinking and experiential learning attributues. Emphasizing the objectives, content, and methodology, the research ends by drawing up a conceptual framework in which the principles of sustainability are fostered within the practices of experiental learning.

Key Words:

Sustainability – Experiential Learning – Interdisciplinary Curriculum Model

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INTRODUCTION:

In response to plentiful global and local calls for the urgency of creating sustainable societies, moving design education toward sustainable thinking appears as one of the most controversial issues among architecture educators. The question in debate is whether or not the design profession can meet the enormous ethical and intellectual responsibilities required to achieve sustainable design work? In the meantime, how can design education, its objectives, content, and methodology be employed to allow future architecture to meet their expected roles?

Re-examining the current architectural curricula indicates that while many schools of architecture focus on the artistic aspects of design, others concentrate only on promoting technical and mathematical skills[1],[2]. In most cases, curricula are mainly based on three premises; architecture as art, the studio master and his students, and design creativity as the most important skills to be acquired by young architects. In Africa and the Middle East, studies indicate that concepts of sustainability are in their birth phase within architectural education process. Only a few positives attempts are witnessed to introduce issues related to environmental concerns through some individual courses.

Despite the fact that sustainable thinking is fundamentally based upon integrating economic/environmental and socio/cultural domains, yet, architectural education programs are still consistently focused on only one or two of these domains. Based on such contention, this research deals with the question of how to incorporate concepts of sustainability in educational programs in order to prepare future architects for their anticipated roles.

The objective of the research is to address the significant links between educational methods and tools that provide learning experiences needed to promote skills and attitudes required by sustainable thinking. In order to achieve such objective, the research places emphasis on several attributes concerning objectives, content and methodology of the design education that need to be reconsidered in light of the demands of sustainability. The development of integrative knowledge, the interdisciplinary design approach and the partnership are proved as key concepts that reflect tremendous changes on the mechanism of design education.

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[1] Salama, M.A. (2002). "Environmental Knowledge and Paradigm Shifts: Sustainability and Architectural Pedagogy in Africa and the Middle East". In: "Architectural Education Today – Cross Cultural Perspectives". Salama, A., William O., Kaj, N.
[2] http//www.bsu.edu

On this base, the research argues how methods and tools of experiential learning can be used to develop an educational framework for architecture students that allow them to extend their abilities for achieving sustainable design work. In order to achieve its targeted objective, the methodology of research is based on a content analysis devoted to determining the key components addressed by sustainable thinking and that are to affect education and knowledge of environmental studies. Then, a comparative analysis examines and evaluates an election of curriculum models that adopt sustainable thinking in perception as well as in application. Bringing together the findings of the studies, a framework is then proposed, intended as an approach towards incorporating experiential learning into a sustainability-oriented curriculum model.

SUSTAINABILITY – A GLOBAL ENVIRONMENTAL ETHIC AND VALUE SYSTEM:-

Sustainability is a term used with increasing regularity in the environmental arena, during the last three decades. The term means many things to many different people in different disciplines. For example, and from an ecological perspective, sustainability is regarded as a way of living that allows others to meet their needs now and in the future[1]. While in ecological economics, sustainability represents the idea of justice with respect to future human generations as well as generations of other species.

More specifically, Costanza explains how the idea of sustainability is based on the acts of connection and linkage, as the word (sustainability) is derived from the Latin *sustinere*, meaning "to hold". It refers to the quality of upholding or supporting. Accordingly, sustainability can be regarded as a relationship between dynamic human economic systems, and larger dynamics, but slower-changing ecological systems in which:

- Human life can continue indefinitely.
- Human individuals can flourish.
- Human cultures can develop.

Meanwhile, and within this relation, effects of human activities remain within bounds, in order not to destroy the diversity, complexity, and function of the ecological life support system. Concerning the built environment, the concept of sustainability involves a complex relation between two domains:

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[1] http//www.bsu.edu

economic/environmental on one hand, and socio/cultural on the other[1]. The concept of self

sustainability in urban development –according to Girard (1997), is the dynamic abilities of

multiplicity systems (ecological, social, and economic) to continue to adapt and readapt themselves to

change.

The previous explanations indicate that the main concept of sustainability lies in the power and

willingness of societies to live within limits and to understand the interconnections among economic,

social, cultural, and environmental aspects. Such understanding is definite to lead to the creation of

effective system of resource distribution and opportunities with a long-term perspective in mind.

Thus, it could be addressed that:

- Sustainability is strictly connected to social dimension, namely to the relationships among the different groups and cultures.
- These relationships are based on the idea that the welfare of the individual in the community is linked to the welfare of the system itself.
- Multiplicity and differentiation should not build invisible walls in human life. Meanwhile conflicts, individuality, isolation, and plurality should be replaced by concepts of cooperation, and participation.

Given the above, values and ethics is the foundation of sustainability. Accordingly, the core of the

environmental ethics lies in the development of knowledge that leads to higher quality of mind and

being. This core is surrounded by the major areas of concern related to sustainability (social equity,

economic opportunity, and environmental responsibility); and all the potential actors (faculty,

students, practitioners, citizens, administrators) (*FIG. 1*). The diagram shows that commonality can be

regarded as the key concept in sustainable thinking. Boundaries, therefore, must be crossed into areas

from which people draw more energy, particularly in the domain of values and ethics. Meanwhile,

technical excellence by itself will not meet challenges addressed by concepts of sustainability.

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[1] Salama, M. A (2002). "Environmental Knowledge and Paradigm shifts: Sustainability and Architectural Pedagogy in Africa and the Middle East". In: "Architectural Education Today. – Cross Cultural Perspectives". Salama, A., William O. Kaj, N. Lausanne: Comportments.

Values, with respect to sustainable thinking, reflect different points of view, not only that of subjects acting on specific situation. In his explanation of sustainable urban development, Gerard (1997), suggests that values mean a complex system which includes social/community dimension and future needs. They –values- could be regarded as multiple (single and social) evaluations which express the concept of solidarity with long-term perspective. However, values in most societies are used to be considered as isolated from each other to preserve separate worlds. Each aspect is valued on its own merits, not its totality.

`s in the ethics and system value are tackled by aspects of sustainable thinking. Therefore, preparing future generations to be acquainted with these changes is an essential demand in both local and global levels. Three major tasks could be identified as follows:

- Developing a sense of common bonds, the challenge for not only focusing on technical excellence, addressing and advising on repent issues, but to nurture the values that will permit and promote a new global ethic.
- Efforts should be made to enable students to bridge the divisions that exist for purposes of identity only, nor for different treatment (the dividing lines of gender, income level, religion, specialization, profession).
- Emphasis should be placed on commonality and cooperation rather than separation and isolation.

At this point, question in debate is how the previous tasks can be reflected on education and knowledge in order to promote willingness within the societies to accept the required changes? The next section is devoted to answering this question.

EDUCATION AND KNOWLEDGE FOR SUSTAINABILITY:

Undoubtedly, education should be strongly linked to the new way of thinking about and managing human activities and its impact on natural systems. In the meantime, the concept of throughout lives, which is raised by sustainability, is a fundamental aspect of education thinking.

With respect to sustainability, it is argued by several studies that education is also seen as a process of changing values and lifestyles, disseminating existing knowledge about the need to achieve sustainable production and to improve the management of natural resources, and promoting a deep understanding of the interdependence of natural, socioeconomic, and political systems at local, and global levels[1,2,3]. Based on this perspective, three main questions concerning attitudes toward knowledge are evoked, these are:

- What kind of knowledge is needed to support sustainable development?
- How can this knowledge be obtained?
- What are the necessary steps for moving into the future?

Interdisciplinary knowledge is mainly what is needed to provide a basis for understanding and solving highly complex, real world problems at national, regional, and local levels. Such knowledge is not

[1] Ospina, G. L. (1998). "Putting New Bite into Knowledge". In: "Organizing Knowledge for Environmentally and Socially Sustainable Development". Proceedings of a Concurrent Meeting of the Fifth annual World Bank Conference on Environmentally and Socially Sustainable Development, "Partnerships for Global Eco-System Management: Science, Economics and Law". The World Bank, Washingtom DC., USA.
[2] Prewitt, K. (1998). "The Critical Path: Linking Knowledge to Advance Environmentally and Socially Sustainable Development". In: "Organizing Knowledge for Environmentally and Socially Sustainable Development". Proceedings of a Concurrent Meeting of the Fifth annual World Bank Conference on Environmentally and Socially Sustainable Development, "Partnerships for Global Eco-System Management: Science, Economics and Law". The World Bank, Washingtom DC., USA.
[3] Serageldin, I & Thatcher P. (1998). "The Social-Natural Science Gap in Education for Sustainable Development". In: "Organizing Knowledge for Environmentally and Socially Sustainable Development". Proceedings of a Concurrent Meeting of the Fifth annual World Bank Conference on Environmentally and Socially Sustainable Development, "Partnerships for Global Eco-System Management: Science, Economics and Law". The World Bank, Washingtom DC., USA.

objective in itself, or as theoretical as it may sound. Rather, it is a knowledge that is approachable to action. Based on literature, obtaining such knowledge depends on the abilities to break down the traditional disciplinary boundaries and to create a new capability to address the profound questions posed by the concept of sustainability. This reveals the need to develop new educational methods based on knowledge integration in order to mirror current economic, social, political, ecological, and technological realities, as well as the diverse requirements of human society.

As a step toward achieving such integration, literature in sustainable education stressed several critical considerations that need to be regarded as major goals for educational systems[1].These considerations can be summarized and pointed out as follows:

- The need to develop systems controlling universities so that they can contribute to establish what is called an "international democracy of knowledge", and allows moving toward a sustainable future without losing regional identities and the diversity of cultures.
- The development of an interdisciplinary approach that highlights the interrelationships between disciplines and allows for study and research across the traditional disciplinary lines.
- No single discipline or institution can individually face or act toward the previous considerations. Therefore, there is a need for partnership with respect to the concerns, and sharing of knowledge, across disciplinary boundaries.

On this base, two different tasks are required to systematize the existing knowledge base and share it widely. The first is; using all the powers of modern technology, and the second is; establishing a system that allow life long learning for all professionals in practice life.

Given the above, sustainable thinking draws essential attributes on components of education and knowledge. Such attributes lead to tremendous changes in the educational thinking in all the discipline of environmental studies. Concerning the design education, attributes of sustainable principles should be framed by the expected role of architecture and architects in order to identify key issues for the content and the structure of architecture education.

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[1] Serageldin, I. & Thatcher, P. (1998) *(Previous Reference)*

DESIGN EDUCATION FOR SUSTAINABLE DESIGN:

The integration of sustainable thinking in methods and content of architecture education strictly depends on deep understanding of the mission of architects to create environmentally responsive designs, or what is called "sustainable architecture". Responding to this mission, terms such as "ecological design" or "sustainable design" have emerged among the design field. The terms raise debates about how to identify and explain meaning, goals, processes, and skills required to achieve sustainable design work.

It could be concluded that sustainable design is a set of perceptual and analytical abilities, ecological wisdom and practical wherewithal essential to create things that fit in a complex of systems (social, economic and environmental)[1]. Design, therefore, has nothing to do with fashion statements and trendy labels that are often attached to clothing, appliances, and even some buildings conceived to project prestigious images. Environmental design is where the earth –with all its related processes- joins with human culture and behavior to create form.

Thus, it is the task of allowing careful meshing of human purposes within the larger patterns and flows of the national world. By careful analytic study, and invention of solutions, sustainable design aims to accommodate human purposes with long term visions. On this line, Lyle (1998) states the meaning of design in respect to sustainable concepts as it is the process of conceiving and shaping complex systems.

Concerning the design process, five principles characterize sustainable design processes: (1) solutions start with knowing where you are; (2) trace the footprint and follow the flow, both through human and ecological principles and through analysis of the existing environment; (3) design with nature; (4) everyone participates in design, not just design professionals. Everyone is a source of knowledge; and

(5) learn from what you design and share it. Design in this sense requires reestablishing some connections between art and science. At its best, environmental design is where people and nature meet, art and science join and where society and technology integrated.

From another retrospective, sustainable design is clearly not the work of a single individual - though designers can certainly lead the way. Sustainable design necessarily calls on the knowledge and skills of a great many people-architects, landscape architects, planners, scientists, artists, engineers, social scientists, as well as those affected. It is a team effort, truly interdisciplinary in applying collaborative processes.

Based on the previous explanation, and toward the integration of sustainable thinking, architecture education is facing three main challenges, these are:

- *Sustainable design* by its complex nature points to the need for architectural programs that join with other disciplines to develop more new integrative knowledge.
- *Sustainable design* also suggests a curriculum built around collaboration and team work, mainly with other disciplines.
- *Sustainable design* requires an educational program that aim at fostering engagement and effective communications with communities.

The preceding challenges could be regarded as key concepts for moving design education toward sustainable thinking. They also raise questions about how can architecture educators respond to these challenges and prepare future architects for their expected responsibilities. The domain of educational studies provides rich ideas and methods that allow integrating sustainable thinking in structure and content of architectural curriculum. The *experienced learning* is one of the methods that can be adopted to promote and enrich learning skills required to achieve sustainable design, in respect to the previous three challenges. The next section is devoted to elaborate this issue.

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[1] http//www.bsu.edu

FALLACIES OF THE CONVENTIONAL EDUCATION IN ADDRESSING SUSTAINABLE THINKING:

In contrast to sustainable thinking in education -in our universities as well as in our culture, there are seemingly self-evident assumptions that thinking is one thing and feeling is something else, that theory and practice are separate, and that clarity is always closer to truth than ambiguity. While concepts and ethics addressed by sustainable thinking in education promote students' confidence in their ability to comprehend rightly their own minds, bodies and the world around them, it can be concluded that previous assumptions result in students' slowly loses of minds at the same time losing their worlds.

On the same line, Maurice M. Ponty addresses that; the world is not we think of but what we live through[1]. Therefore, students can hardly understand and think about things which nevertheless they are able to do. On the contrary, in most of educational institutions, the truth of modern science can be demonstrated only in high technical and mathematical formulations that do lend themselves to expression in normal life thought and situations. From an educational point of view, such thinking attitudes are contested with sustainable thinking that is based on acquiring knowledge by action and interaction, in order to mirror social, political, and economic and ecology reality. Moreover, such supposition has proved itself wrong, with the introduction of the "experiential learning" that can be applied to any learning discipline or educational formulation. Based on the preceding, a shift towards experiential learning is urgently needed.

WHAT AND WHY OF EXPERIENTIAL LEARNING:

Reviewing philosophical, psychological and educational literature sheds light on some aspects that altogether can formulate a definition of experiential learning. *Hegard*, 51, deduced that learning - through observation of change in performance- is indicated through practice of training and experience. *Mc. Gosh*, 53, suggests that learning is a change in attitude achieved under the condition of experience. *Hoffland*, 51, affirms that learning is conditioned with experience, as experience offers

the situation for the learner to show what he might posses of change in performance[2]. Concluding, it can be affirmed that the only condition through which learning can be tested/measured and evaluated is through *experience*.

Other theories, those of *Piaget*'s interactional model of knowledge transfer (1972), *Kolb*'s model of the learning cycle (1984) and *Jung*'s model of the conjecture-analysis (1976), suggest that while *Kolb* places emphasis on the experience, followed by reflection, which in turn is then assimilated into a theory and finally these new hypothesis are tested in new situations.

In his model, *Piaget* focuses on how knowledge can be matched with the ability to assimilate it, assuring that problems should be assimilated by the students' cognitive schemata and then accommodated within the acquisition of new knowledge. Finally, and from retrospection, *Jung* asserts that although there are functions that block one another, each function should be utilized in its own particular area in which it performs appropriately better than the others[3]. Furthermore, and reading through Bruner's Cognitive theory and Gagne''s learning processes and the external events that influence on the different facets of learning phases, it can be concluded that while *Bruner*'s basic concern is the curriculum structure, *Gagne''*s is the outcomes of teaching of particular curriculum and the ways for achieving them. A relation can be now drawn upon the existence of elements or factors or stimulators or resemblances as the new situations require skills, or trends/attitudes or knowledge or conception of what is learned from previous situations[45].

We can then structure the definition of experiential learning as the learning paradigm that involves several terms such as laboratory sciences, applied studies, clinical experiences, studio arts and field

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[1] http//www.bsu.edu

[2] أحمد زكي صالح (1983). " نظريات التعلم". القاهرة: مكتبة النهضة المصرية.

[3] Safey Eldeen, H. (2002). "Experiential Learning in Undergraduate Education". <u>In</u>: "Architectural Education Today – Cross Cultural Perspectives". Salama, A., William O., Noschis.K. Lausanne: Comportments.

[4] Bruner, Jerome S. (1966). "Toward a Theory of Instruction". Cambridge, Mass.: Harvard University Press.

[5] Gagne', R. M. (1970). "The Conditions of Learning". N.Y.: Holt, Reinhart & Winston.

studies. Either in or off-campus, experiential learning is the apparatus in which the learner is subjected

to situations where he/she develops and asseses his/her critical thinking abilities, thus allowing for

freedom of creative thought and preparing for a lifetime learning process[1].

Experiential Learning, in this manner, is the primary validation source of a student's own learning,

throughout a life that involves a countless number of learning experiences. It enables students to:

- Better understand and cope with the surrounding environments.
- Explore issues and develop/enhance problem solving skills.
- Reflect on his/her own learning.
- Develop a thinking mode that is testable, arguable, comparable, refutable, reproducible and analyzable.
- Monitor and evaluate his/her own processes of working.
- Develop self-responsibility and self-regulation.
- Develop communication skills.
- Develop team working skills.
- Take charge of his/her role and participate effectively in his/her communities[1].

From the above, experiential learning determinants and sustainable design education may be

incorporated in three main issues; *the urge of building relationship with the community*, *the

development of an interdisciplinary thinking approach*, and *the need for an integrative knowledge

base*. These three main issues can be explained as follows:

FIRST: BUILDING A RELATIONSHIP WITH THE COMMUNITY:

Sustainable thinking draws essential social and ethical responsibilities on architects. This is evident by

the key to sustainable design for communities to pursuit balance in man's life by working in balance

for justice towards the natural environment, towards the different groups of society, and towards the

good of all with long term perspective. On this base, several studies argued that architects and

architecture have wide impacts on communities, on both local and global levels. The impacts are

caused by fostering sense of connections between people, and between people and all aspects of place.

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[1] Keeton, M. T. & Tate, P. J. (1978), "Introduction". In: M.T. Keeton & P.J. Tate (eds), "Learning by Experience: What, Why, How: New Directions for Experiential Learning". San Francisco: Jossey Bass.

Based on the above, it could be addressed that since the whole of humanity is the client for sustainable design, and community outreach is essential for effective local action, thus, architects when dealing with design issues, must think globally and act locally[2]. Preparing students for this critical practice future requires different approaches to design education. To that end, the collaborative/ interdisciplinary studio brings the university, the business community (providing financing) and the community itself (represented by non-profits organizations) together around community-based projects[3]. Figure (*2*) is a diagram that represents a conceptual model of community focused design approach. Based on the diagram, the proposed approach highlights the idea expressed by the term "caring design education" which indicates that students can work with the community in order to produce integrative knowledge and to clarify how designers can create sustainable communities.

Concomitantly, several design concepts are introduced as educational approach to design with the community, such as architectural programming, post occupancy evaluation, and user participation[4]. Salama (1995) argues how these concepts are effective tools for educating future architects how to communicate human and social needs, to involve the community in the design process, and to evaluate the built environment in order to make adaptation and adjustments.

In his translation of the "caring design concept into practical terms", Sanoff (1992) he proved that process of working with community in design education individual learning is fostered through increased awareness of a problem. Maximizing learning opportunities depends on how the process is clear, communicable and open[5]. Thus, dialogue, debate, collaboration and flexibility are key components in order to increase the value of the learning process for both students and community.

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[1] Nicol, D. & Pilling, S. (2000). "Architectural Education and the Profession: Preparing for the Future". In. Nicol, D & Pilling, S. (eds), "Changing Architectural Education: Towards a New Professionalism". London: Spon.
[2] http//www.bsu.edu
[3] http//www.bsu.edu
[4] Salama, M. A. (1995). "New Trends in architectural Education: Designing the Design Studio". Cairo: The Anglo Egyptian Bookshop
[5] Sanoff, H., (1992). "Caring Design Concept into Practical Terms". New York, NY: Van Nostrand Reinhold.

Employing experiential learning in this context surpasses in destroying the boundaries and the distinction between class lectures, studios and the off-campus learning. In this regard, students are exposed to real life problems, in which they are anticipated to create solutions that are most agreed-upon by the community, comprising key-role players of; local groups, clients, decision makers, business community, non profitable organizations, and the university community.

The role of experiential learning is also envisioned as paramount for students' hands-on existing dynamics and variables within their natural contexts and settings, creating a discourse of know-how and confrontations through the close examination of the imperatives, restrictions and consequences of design process.

A third return of experiential learning in such a situation is that students are offered the opportunity to interact, make decisions and act on those decisions. Such interaction with the community increases students' awareness of the range of options available to solve a particular problem[1]. Moreover, students are obliged to transform behavioral information and experiences into actions of visual, tactile, written and drawn communicable deeds and actions.

Summarizing the role of experiential learning in addressing the issue of building a relationship with the community in sustainable-design-education can be pointed out as follows:

- Interaction and involvement in real life problems with real life actors.
- Hands-on-experience on dynamics and variables of design process.
- Know-How of transforming behavioral information into design decisions.

SECOND: THE DEVELOPMENT OF AN INTERDISCIPLINARY DESIGN APPROACH:

An interdisciplinary approach to design sustainability as a social concept requires quality in individual projects, but within collective discipline. On this base, design for sustainability crosses disciplinary borders. However, interdisciplinary approaches are curiously absent. In a sustainability context, architecture potential contribution is a unified theory of human settlement to relate all scales; large

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[1] Sanoff, H. (1994). "School Design: Planning with People". New York, NY: Van Nostrand Reinhold.

scale, bioregions, city regions, neighborhoods, urban fabric, and ultimately, individual buildings and open spaces (*FIG. 3*).

The compartmentalized world of different disciplines and different systems world is against that notion of a unified theory. This explains the demand for design teams which include architects and engineers working on transportation, soils, hydrology or civil engineering; landscape architects, planners, natural scientists/environmentalists, economists, and sociologists. Afterwards, each would specialize according to their individual scale of intervention.

On the same line, it is evident by several studies that designing responsive ecological environments requires an integrative approach to design in order to incorporate social, economic, and environmental aspects in the design process[1]. An approach introduced by El-Nachar (2000) is based upon concepts and techniques that promote cooperation, partnership and participation among different disciplines, and parties involved in the design process. Concomitantly, a call for an interdisciplinary approach to design education is stressed by several reports[2]. Evidently, there is a crucial need for architects and students of architecture to learn to work in multidisciplinary contexts[3].

The work depends on the idea of forcing useful dialogue between designers and other professions. Although the two parties do not have common formulas or models, yet, there are common grounds where there are links and counterparts within terms, theoretical and methodological realms. Communication and collaboration, therefore, are major keys for achieving integrative approach to design. Each of the two keys suggests and reflects important issues concerning the design education:

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[1] El Nachar, E. (2000). "Designing Sustainable Communities around Cairo: A Multi Disciplinary Approach". IAPS 16 Conference Book.
[2] Wood, G. (2000). "Interdisciplinary Working in Built Environment Education". In: "Changing Architectural Education – Towards a New Professionalism". Spon press, New York.
[3] Beamish, A. (2002) "Strategies for International Design Studies: Using Information Technologies for Collaborative Learning and Design". In: "Architectural Education Today – Cross Cultural Perspectives". Salama, A., William O., Kaj, N. Lausanne: Comportments.

Communication, on the one hand, plays a vital role in breaking boundaries between architectures and other students and professions in other disciplines. The idea is to learn how to find a language to communicate outside the design field. ***Collaboration,*** on the other hand, means in the design field a process which is organized to strengthen different disciplines to be integrated in the design product.

The biggest impediment to learning to communicate and to collaborate is an ethos with which students are inculcated early on. Often, the first signals they get from the jury system are that collaboration, even with their fellow architecture students, is problematic. The primacy of invention over convention is usually an unstated principle in schools of architecture. Therefore, a paradigm shift from obsessive originality to invention within convention inventing alternate rites to reward cooperative attitudes may help students develop new values.

On the opposite side, in the existing conventional architecture education, the traditional studio model has placed emphasis on originality and individuality[1]. The jury system has rewarded and encouraged individualistic behaviors and attitudes. Design studio should create certain atmosphere to allow students from different disciplines to come together in collaborative design work.

The recommended atmosphere should approximate a model of the world, where students learn by doing, through undertaking works that simulate practice. Students, in this manner, are offered the opportunity to interact, make decisions and act on those decisions. Accordingly, many ideas and thoughts can then be crystallized during an open assesment, thus they are empowered to better understand the physical and social environment, approach it and be able to make decisions about it.

This goes beyond the printed literature and overheard lectures, to the comprehensively exploring issues and needs that foster sensitivity to listen, notice, observe, differentiate, consider and analyze

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[1] Salama, A. (1995). "New Trends in Architectural Education: Designing the Design Studio". Cairo: The Anglo-Egyptian Bookshop.

relevant from irrelevant information. Such atmosphere also calls on that in-class a humanized, democratic climate should be felt. The arrangement of its layout might also be modified to encourage communication, challenge students' anxiety and enthusiasm, and change their attitudes from merely receivers to actual encounters, thus flourishing their sense of responsibility as well as their creative thinking abilities. Lectures might also include group discussions with different educators as well as real key-role players of designers, and public representatives.

In this context, experiential learning operates as demonstrative apparatus for the targeted interdisciplinary notion in both thinking and designing. An interdisciplinary design approach requires an interdisciplinary thinking mode that connects among the various materials taught and links between the separate boundaries of knowledge introduced. To design properly, in this attitude, means to think properly, knowing how to put all parts together. To work back and forth between scientific, metaphoric and critical thinking, with periods of experimentations in between; a synthesis process that does not vary much from the systematic design synthesis process. Employing experiential learning here is anticipated to result in the ability of students to abstract, conceptualize and theorize from disconnected bodies of knowledge, elucidate complexities and interconnections embedded and reflect them- through analogy and discourse- to serve as an articulation of intentions and meanings verified in their design solutions.

Communication and collaboration, foreseen in lights of experiential learning, are anticipated to strengthen and integrate students' analytical, linear, sequential thinking from one side, as well as their synthetic, patternisitic, relationship-cognitive, intuitive and imaginative thinking from the other side.

Summarizing the role of experiential learning in addressing the issue of the interdisciplinary design approach in sustainable-design-education can be pointed out as follows:
- Working back and forth between scientific, metaphoric and critical thinking.
- Abstracting, conceptualizing and generalizing from disconnected bodies of knowledge.
- Putting all parts together, through communication and collaboration, thus strengthening and integrating both cognitive as well as imaginative skills.

THIRD: THE NEED FOR AN INTEGRATIVE KNOWLEDGE BASE:

Three different kinds of experiences and areas of information could form the basis for sustainable design: *design with nature* and nature as a model are (ecological basis); *knowledge and experience of place-based cultures*, in which design is basically intuitive and built in place; and *knowledge transfer from technology and industry*, particularly new ideas about industrial ecology. The systems model is place-based with an ecological framework at different scales of experience region, building, and component. The experience that one designs in a curriculum for students should try to set up situations where brushing with things outside their realm is purposeful. For example, in a design/build program, although feedback loops exist within the process of working with and learning from others in a community context. But adding ecological issues achieve a viable systems model technique.

Concerning the design knowledge base, it is self-evident that most designers operate in a very narrow realm of scales [building project and dwelling] although our impacts affect scales above and below (*FIG. 3*). In design with nature, some design considerations go down to the atomic scale (ten to the minus twenty first (10^{-21} meters)) and all the micro-scales, the levels in which genetic information is coded; then up to the visible scales in which design typically takes place. Ten centimeters is the scale of a hammer, a tool, and the hand. Vitruvisus's human scale starts at about a meter. Ten meters is the scale of the dwelling. One hundred meters is the building project scale and also the largest objects in nature-the biggest tree and whales. At one kilometer scale are neighborhoods and cities; at 100 kilometers scale are landscapes and ecosystems; and at 1000 kilometers are regions and biomes. The impacts of materials or toxins go all the way down to the atomic scale and those atomic scales impacts go all the way into the environment, generating problems to sustainability[1].

The question that should be asked here is how can designers be responsible in positive ways for all these scales? The answer is that design task may be focused to develop a common language for scale-linking processes, from the smallest to the largest scale. Since nature is a connected seamless whole, it is essential to identify processes that link scales and that need to be understood in order to design. At

each of the different scales is an entire system that works as a whole ecosystem. Thus in design education, students learn to think of neighborhood including nature as an integrated whole. All different scales and knowledge bases (e.g. community wisdom, geography, systems sciences, etc.) should be treated interactively and evolutionary. Therefore, it could be stated that modes of knowledge acquisition include; conventional sources of information, books and so forth, case studies in the studio, and finally, direct experience.

For instance, students ought to experience place-based cultures directly, because these are the things that they can't do very well in the classroom. Four flows to consider are: (1) energy flows, (2) material flows, (3) information flows (and designing information systems), and (4) capital flows. Depending on the values and the culture of the human system, all of these flows change including concepts of money, reciprocity, and the various mechanisms in the community that become exchange systems to make up for limitations of current monetary system.

The sustainability knowledge base for design must have a language. Life cycle language includes about eighteen different scales. Present-day studio experience has been working at only one to three scales. At building scale, the Environmental Resources Guide (*ERG*) spans a number of these life cycle steps. At planning and landscape scales ecological inventory has not been done yet. Normative or conventional issues represent 99% of activity that goes on daily in the building world. To effectively meet their challenges, everyday projects must be used rather than isolated or special examples outside the mainstream. Students would work in all the standard templates at various scales, and then analyze them to see how they work and/or fail. New possibilities open up for design starting with the standards. Neighborhoods must be included as a focus, as they cause students to deal with the social and the environmental questions head on, arguably more than at the building project or dwelling level.

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[1] http//www.bsu.edu

In this domain, and in lights of experiential learning, the sustainability knowledge base for design is multidisciplinary, and must span to touch everything of human value. Such "experiential" body of knowledge should utilize the built environment as an open text book, introducing quantitative and qualitative standards in addition to aesthetic considerations. Environmental studies and socio-behavioral impacts are a corner stone of this knowledge base, in addition to political, socio-economic, historical and cultural studies.

Moreover, such "experiential" knowledge base must be justified by arguments, reasons that show why a certain statement is true or a certain action is sensible and in which context it is valid. Reasons give the bases for knowing and acting, as well as putting action in a context[1]. The recall of specifics as well as universals, the recall of a pattern, structure or setting serves as real and close contextual examination for comparative analysis of how a particular cultural setting affect thinking and reacting in a particular situation. Much of this "experiential" knowledge content must be introduced in its true setting, outside class physical borders and conceptual limitations.

Summarizing the role of experiential learning in addressing the issue of the integrative knowledge-base in sustainable-design-education can be pointed out as follows:
- Introduction of a multidisciplinary knowledge-base, touching everything of human value.
- Utilizing the built environment as an open text book; to learn from and learn about.
- Contextual examination and comparative analysis of patterns, setting and/or structures.

SUSTAINABILITY-ORIENTED CURRICULUM MODELS:

Reviewing the available sources, there proved to be several model projects that aim at materializing sustainability principles into design education. Some of which are selected for analysis on the following few pages. The first five models are developed at the first Educating Architects for a sustainable Environment (*EASE*) project planning conference held in 1994, with more than 140 recommendations that were later presented as a "buffet" allowing schools, students, faculty, administrators and practitioners to adopt or adapt those recommendations to be most appropriate

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[1] Lundequist, J. (1998). "On the Articulation of the Practice of Architecture. In: Woyseth, H. D. & Noschis, K. (Editors): "Architecture and Teaching: Epistemological Foundations". Lausanne: Comportments.

according to their individualities. The sixth model presented is a case-study of the "center for regenerative studies as a Neotechnic Community, (1993). The seventh and last model is from California State Polytechnic University[1]. Models are analyzed according to their; ***objectives***, ***content*** and ***methodology*** of delivery. Results of the analysis are summarized in the following table:

Model	Objectives	Contents	Methodology
1. Health, Safety And Welfare Redefinition Curriculum	• Determined to protect public health, safety and welfare against urban ills, overcrowding, poor constructing, unchecked combustible building materials. • Focuses on assemblies that made risks of fire and catastrophic building failures probable, poor sanitation and environmental quality causing diseases and rodent-infested living conditions, etc. • Targets to span rich multi-scale of design projects and processes.	• Introduces design projects of scales that range from the size of a room to the entire planet, with emphasis on sustainability parameters. • Design problems introduced expand beyond disease prevention and nuisance control to include mental as well as physical health. • Projects contexts require students anticipate design consequences at many scales. • City governments, insurance companies, all entities involved in design and construction suggesting codes attempting to remedy ills, licensing laws developing to make building and safer to use.	• Relies on offering opportunities of self-realization, creation of spaces that enable delight, hope and enable vision and the realization of human, potential and protecting the ecological health of a place. • Teaching pedagogy and learning style and pedagogy, are structured with emphasis on education research appropriate to learning content and intended outcome.
2. Design And Build Curriculum	• Aims at providing students with hands-on-experience. • Promotes requisite self-condition. • Develops commitment, accountability and responsibility for building. • Endengers respect for diverse viewpoints that come out of working with communities.	• Existing community-design-centers are structured to support this curriculum. • Content emphasizes communication with lay person, real world, budget, client, using materials, resources and tools.	• Instills sharing and collaborative value in students while teaching skills. • Teaching methodology links theoretical parts to real world. • Through experiential learning methodology, fosters skills of teamwork, problem solving and critical reflection.

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[1] http//www.bsu.edu

3. Split Program Curriculum	• Aims at generating knowledge about human environment. • Places more responsibility on individual schools to shape distinct educational agendas particular to their environments.	• The content is research-oriented towards human-environmental relationships, thus increasing prospects for good design. • Fosters arrange of career patterns, outcomes or options by advocating a non-perspective curriculum.	• Suggests a beginning of architectural education with a liberal art foundation. • Emphasis is placed on all forms of communication, within regularity context and all the potentials specific to sustainability.
4. Whole-Systems Curriculum	• Aims at introducing and applying ethics of sustainability as the relationship between humans and the natural environment. • It is thought of as the beginning of education followed by practical experience; a first step in a lifelong awareness that brings design continuity into internship.	• Provides students with a foundation in ecology, biology, systems theory and other environmental ethics. • Through a lose structure of options for students, the courses are all interdisciplinary, with a large component of field work, researches and work with community.	• The whole school is a multidisciplinary-frame-work design school, where building design is mixed with regional planning studios. • The basic educational theme is thinking and doing, with emphasis on the interaction of creative and critical thinking. • In systems, working takes place from personal to global scales.
5. Knowledge-Based Curriculum	• Targets the training of students of critical problems in society leading to collaborative research projects. • Aims at enabling faculty be more efficient and be used more efficiently.	• Encompasses history, introduction to built environment, issues of health, safety and welfare all taught from an ecological perspective. • Content offers the opportunity to expand analysis and evaluation phases of studio in design. • Includes a variety of studios that tie back to multi-disciplinary teachers for each studio.	• The studios are linked with the community, with some emphasized case-studies in studio. • Individually or in teams or within institutions, work is involved in creating a complete studio. • Funds and time to do case-studies are a start.

6. The Neotechnic Community	• Dedicated for preserving the environment. • Aims at the integration of learning with daily life and its merging with technology. • Aims that university community becomes a center for guidance and consultation services in application of practices within its areas of expertise. • Through research, the center aims at establishing a fund of experience and knowledge that offers varied opportunities for contributions as multidisciplinary as agriculture, aquaculture, architecture, landscape architecture, engineering and social science.	• A university-based setting for education, demonstration and research in regenerative technologies. • Includes a broad range of practices and technology dealing with energy, shelter, water, food, waste, and other essential/integral parts of daily lives. • Adapting to the diverse conditions of the environment, landscape and architecture, giving visible expression to fundamental relationships between humans and nature implicit in regenerative practices.	• Through an interdisciplinary- ongoing interaction, learning by doing takes place in laboratory courses conducted on the site. • Effective application of the relationships between regenerative practices and human attitudes and behavior, forming a cohesive social unit. • Explores and demonstrates the interactions between people and technological practices as well as the practices themselves. • Shaping the architecture of site and buildings, to establish optimal conditions for the operation of regenerative technologies.
7. Ball State's Architectural Program	• Aims at defining sustainability as part of thee mainstream of architectural education and practice. • Aims at replacing the architect as hero model as architect as team player. • Demonstrates the centrality of those issues within the core of the educational discipline. • Built around collaboration and team work, and with other disciplines.	• Promotes an interdisciplinary/collaborat-ive approach among designers, sociologists, ecologists, etc. • Structures to develop a solid theoretical and research base. • Knowledge content encompasses; energy, use of renewable resources, recycling process, the use of carcinogenic materials and the safe disposal of waste.	• Ties studios to more real life problems. • Develops a fabric of many voices in studio instruction. • Focuses at the connections in design problems, studying the community context of buildings and seeking comprehensive solutions. Including variables such as present and future energy and materials cost.

REFLECTIONS AND INTERPRETATIONS:

The first model, *Health, Safety and Welfare Redefinition Curriculum* addresses the need to

strategically educate and position future architects to broadly understand the natural and built

environment and to be able affect political changes in how building takes place. This model is

expected to prepare future architects by redefining those aspects of health, safety and welfare that are sustainability based.

The second model *Design and Build Curriculum* proposes experiential learning as a key to a new-design-build-based sustainability education model. It relates design-education to construction, teamwork and community bases in an environment that reinterprets the architect-client relationship as essential to the production of good design.

The Third model *Split Program Curriculum* focuses on the structure and composition of design education with a liberal art foundation followed by graduate education in architecture advocated and described relative to a sustainability base.

The fourth model *Whole-systems Curriculum* addresses both the physical as well as the intellectual environments to be conveyed as a model of the world. Through which the living laboratory is analogous to the idea of classroom as pedagogy.

The fifth model *Knowledge-based Curriculum* is driven by critical societal problems in its studio-based education. Concomitantly, research is developed through ascertaining critical problems in society leading to collaborative research projects.

The sixth model *The Neotechnic Community Model* is dedicated to preserving the environment. Through an interdisciplinary ongoing interaction, the model places the university as a center for guidance and consultation for the community. Conducts multidisciplinary research and demonstrates the outcomes on regenerative practices.

The seventh model *Ball State's Architectural Program* stresses on redefining the role of the architect as team player. Developing a solid theoretical base, the studios are tied to more real life problems,

thus fostering the involvement of many voices in instruction, aiming at maximum integration and comprehensiveness.

Although each of the preceding models has a different character, yet, they all share common attributes. Such attributes have been previously proposed as the <u>key concepts of sustainable-design-for-education</u> of the architects, and also hypothesized as <u>determinants of the experiential learning theory</u>. These commonly shared attributes, successively are: 1, the ***practical knowledge base*** that is investigative in nature, comprehensive in structure, multidisciplinary in content. 2, the ***interdisciplinary thinking mode*** encompasses the concrete scientific, metaphorical and the critical thinking modes. And finally, 3, the ***true involvement with the community*** demonstrated and/or actually manifested through participation and collaboration between the architect and the client.

EXPERIENTIAL LEARNING AS A PARADIGMATIC MODEL FOR SUSTAINABILITY-ORIENTED DESIGN EDUCATION:

Through out the research, a theoretical content analysis was undertaken that aimed at establishing a base for the key components that are addressed by sustainable thinking. This base is believed to affect design education and knowledge. Afterwards, a methodical comparative analysis examined and evaluated some sustainability based curricula. Finally and based on this theoretical foundation, the research will be moving toward its ultimate objective; drawing up a conceptual framework that can be considered as a core for the targeted sustainability-oriented curriculum model. The basis on which the framework is to be built around consequently is its objectives, content and methodology, which will elaborated on as follows:

First: Objectives:

- Such model would be dedicated to redefining and fostering the values and ethics of sustainability, as prescribed previously as social equity, economic opportunity, and environmental responsibility. Through this redefinition, an emphasis would be placed on the role of the architect as facilitator and team player in the community within which he serves.

- Another objective of the model would be fostering environmental design as the as an essential attribute in the design education. Addressing both the physical and the intellectual environments is the corner stone in the process of verification of human culture and behavior in the built form.
- A third objective of this model would be its addressing of systems thinking, that is to teach each students how to learn as well as how to teach.

Second: Content:

- The content of such a model would be for a core curriculum to include introductory courses in sustainability, with sustainable thrust in existing courses and in special seminars.
- Through communication networks, an interdisciplinary on-going interaction should be fostered. Such interaction calls on the involvement of many voices in structuring the content.
- Strongly research-based, the model would maximize contact with the community to foster real world learning.
- Through a lose structure of options for students, the courses would all be interdisciplinary, with an opportunity to expand analysis and evaluation phases.
- Real world design would be a base for the curriculum.
- Interdisciplinary collaborative approach would be emphasized (e.g., designers, sociologists, ecologists, etc.).

Third: Methodology:

- The methodology would be built on encouraging the establishment of a relationship of various design disciplines through projects and scales of work on human settlements that cross disciplinary lines.
- Design education should be related to construction, teamwork and community bases in a simulative atmosphere as a model of the world. An interpretation that is essential to the production of good design.
- The studio model should be created such that it serves as a prototype for:
    - Learning by doing.
    - Creation of an interdisciplinary/integrated studio, to hold multi-disciplinary juries and learn to be good colleagues and citizens.
    - Developing more virtual studios among schools, countries, offices, etc. Figure (*4*) illustrates the layout of the proposed framework.

CONCLUSION:

The proposed framework is based on redefining *sustainability* as a global environmental ethic and value system. Then it was prescribed as core principles and issues for design education. Moving along, was an exploration of the determinants of *experiential learning* incorporated as teaching practices for sustainability. Out of already established sustainability-oriented curriculum models, was

an extraction of the major objectives, contents and methodology. Afterwards, the framework was then drawn up, demonstrating the crystal-clear links between experiential learning as a discipline and the ability to produce sustainability premise work. Employing such framework as a core for the targeted model involves incorporating a multidisciplinary knowledge-base delivered in an interdisciplinary design approach and within real community circumstances. The expected learning outcome is anticipated to fruit in architects that would efficiently carry out ethical responsibilities required to respond to the challenges of sustainability.
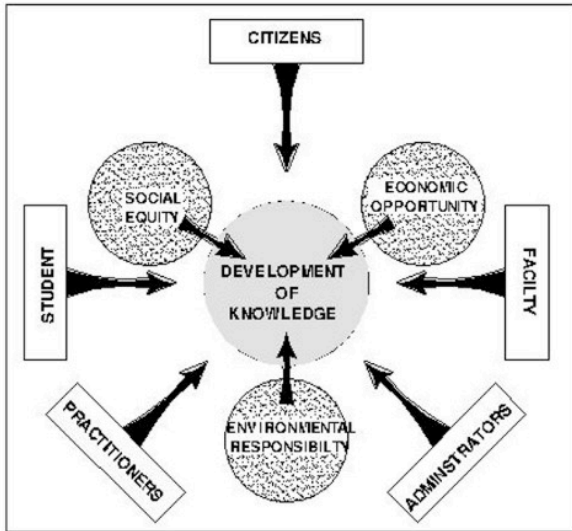
Fig. (1) ... a model for developing integrative knowledge as a global ethic.
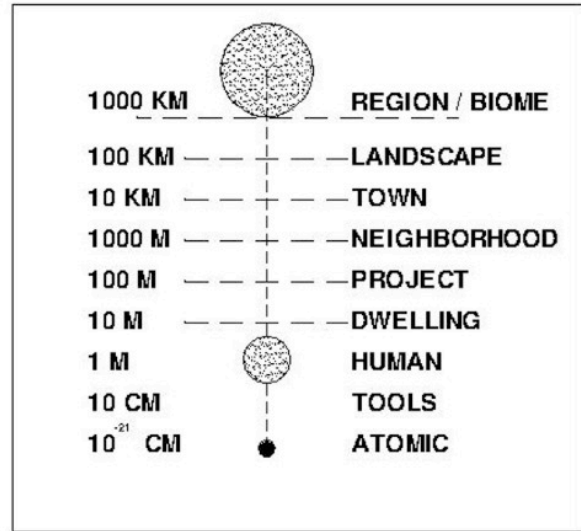

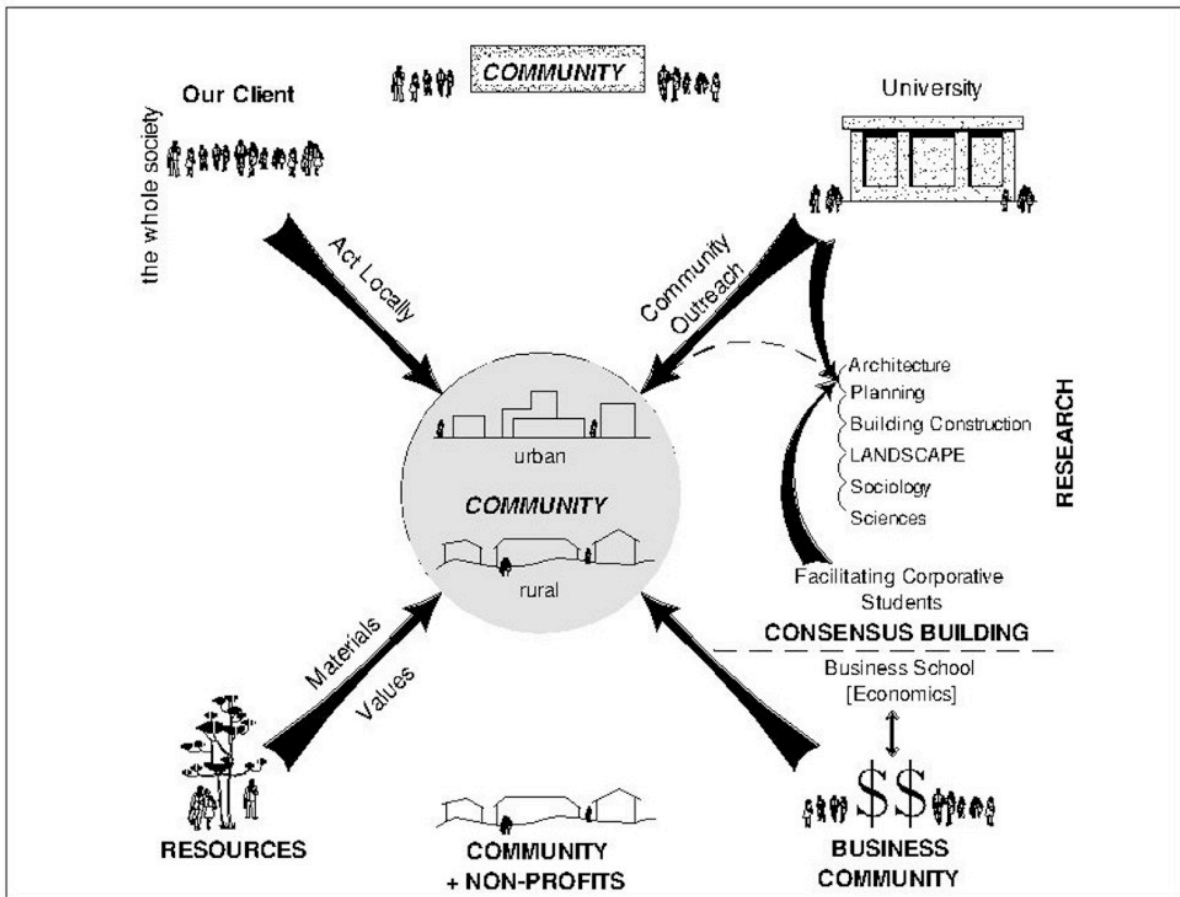Fig. (3) ... multi-scale design with nature source (site).

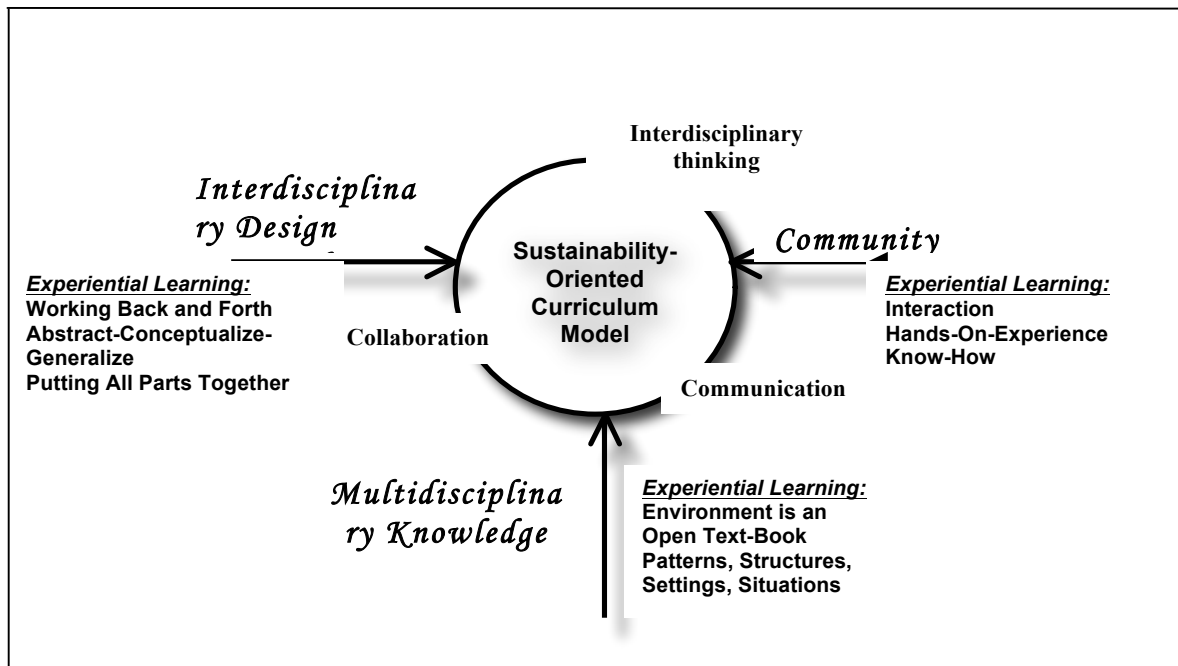Fig. (2) ... a conceptual approach of interdisiplinary communityfocused design.

28

Figure (4) … experiential learning: a paradigm for sustainability-oriented architectural education.

REFERENCES:

- *Beamish, A*. (2002). **Strategies for International Design Studies: Using Information Technologies for Collaborative Learning and Design**. In: **Architectural Education Today – Cross Cultural Perspectives**. A. Salama, William O., Kaj, N.
- *Bruner, Jerome S.* (1966). **Toward a Theory of Instruction**. Cambridge, Mass.: Harvard University Press.
- *El Nachar, E.* (2000). **Designing Sustainable Communities Around Cairo: A Multi Disciplinary Approach**. IAPS 16 Conference Book.
- *Gagne', R. M.* (1970). **The Conditions of Learning**. N.Y.: Holt, Reinhart & Winston.
- *Keeton, M. T. & Tate, P. J.* (1978). **Introduction**. In: M.T. Keeton & P.J. Tate (eds), **Learning by Experience: What, Why, How: New Directions for Experiential Learning**. San Francisco: Jossey Bass.
- *Kolb, David A.* (1984). **Experiential Learning: Experience as the Source of Learning and Development**. Englewood Cliffs, NJ: Prentice – Hall.
- *Lundequist, Jerker* (1998). **On the Articulation of the Practice of Architecture**. In: *Woyseth, Halina Dunin & Noschis, Kaj* (Editors): **Architecture and Teaching: Epistemological Foundations**. Lausanne: Comportments.
- *Milliner, L*. 2000. **Delight in Transgression: Shifting Boundaries in Architectural Education**. In: **Changing Architectural Education – Towards a New Professionalism**. Spon press, New York.
- *Nicol, D. & Pilling, S.* (2000). **Architectural Education and the Profession: Preparing for the Future**. In *D. Nicol & S. Pilling* (eds), **Changing Architectural Education: Towards a New Professionalism**. London: Spon.
- *Ospina, G.L.* (1998). **Putting New Bite into Knowledge.** In: **Organizing Knowledge for Environmentally and Socially Sustainable Development**. Proceedings of a Concurrent Meeting of the Fifth Annual World Bank Conference on Environmentally and Socially Sustainable Development, **Partnerships for Global Ecosystem Management: Science, Economics and Law**. The World Bank Washington DC., U.S.A.
- *Piaget, J.* (1972), **Psychology and Epistomology: Towards a Theory of Knowledge**. London: Penguin.
- *Prewitt, K.* (1998). **The Critical Path: Linking Knowledge to Advance Environmentally and Socially Sustainable Development**. In: **Organizing Knowledge for Environmentally and Socially Sustainable Development**. Proceedings of a Concurrent Meeting of the Fifth Annual World Bank Conference on

Environmentally and Socially Sustainable Development, **Partnerships for Global Ecosystem Management: Science, Economics and Law**. The World Bank Washington DC., U.S.A.

- *Safey Eldeen, H.* (2002). **Experiential Learning in Undergraduate Education**. In: **Architectural Education Today – Cross Cultural Perspectives**. A. Salama, William O., Kaj, N.
- *Salama, M. A.* (1995). **New Trends in Architectural Education: Designing the Design Studio**. Cairo: The Anglo-Egyptian Bookshop.
- *Salama, M.A.* (2002). **Environmental Knowledge and Paradigm Shifts: Sustainability and Architectural Pedagogy in Africa and the Middle East**. In: **Architectural Education Today – Cross Cultural Perspectives**. Salama, A., William O., Kaj, N.
- *Serageldin, I. & Thatcher, P.* (1998). **The Social – Natural Science Gap in Education for Sustainable Development**. In: **Organizing Knowledge for Environmentally and Socially Sustainable Development**. Proceedings of a Concurrent Meeting of the Fifth Annual World Bank Conference on Environmentally and Socially Sustainable Development, **Partnerships for Global Ecosystem Management: Science, Economics and Law**. The World Bank Washington DC., U.S.A.
- *Wood, G.* (2000). **Interdisciplinary Working in Built Environment Education**. In: **Changing Architectural Education – Towards a New Professionalism**. Spon Press, New York.
- أحمد زكي صالح (1983)**."** نظريات التعلم". القاهرة: مكتبة النهضة المصرية.
- http://www.bsu.edu

CONCEPTS GLOSSARY:

http://condor.stcloudstate.edu/~dmichael/eco/basics/basics.htm